

Summary Notes from 15 November 2007 Generic Technical Issue Discussion on  
Sensitivity and Uncertainty Analysis and Model Support

Attendees: Representatives from Department of Energy-Headquarters (DOE-HQ) and the U.S. Nuclear Regulatory Commission (NRC) met at the DOE offices in Germantown, Maryland on 15 November 2007. Representatives from Department of Energy-Savannah River (DOE-SR) and the South Carolina Department of Health and Environmental Control (SCDHEC) participated in the meeting via a teleconference link.

Discussion: DOE believes that based on the position papers provided prior to the meeting, DOE and NRC staff have many areas of agreement and no significant areas of disagreement with respect to the specific sensitivity and uncertainty analysis requirements articulated in the respective DOE and NRC requirements. The NRC position paper was based on NUREG-1854 and the DOE position paper was based on DOE Order 435.1 and its associated technical basis and guidance documents.

Topics: The following two specific topical areas were discussed during the meeting:

1. Sensitivity and uncertainty analysis, including: (i) approaches to considering uncertainty; (ii) estimating degrees of uncertainty; (iii) identifying parameters and process with greatest impact on projected doses; and (iv) use of sensitivity and uncertainty analyses with respect to inadvertent intruder analyses
2. Model support

Summary: The following summarizes the discussion and the principal points of technical understanding identified during the meeting, unless otherwise noted.

*Sensitivity and Uncertainty Analysis*

- NRC staff favors a probabilistic approach to investigating uncertainty. One example of this can be found in its decommissioning guidance which provides information regarding acceptable approaches to demonstrating compliance with dose-based standards in the license termination rule using probabilistic analyses.

- DOE-SR proposes starting with deterministic models for preliminary work, supplemented with probabilistic analyses in order to evaluate the impact of uncertainties. As an example, GoldSim is currently being used to perform probabilistic analysis to address the limitations of using a deterministic approach with sensitivity analyses where one parameter value is changed at a time.
- DOE and NRC staff agreed that GoldSim models may be simplified, which may present challenges in ensuring that the simplified model represents the complex processes it is modeling. Model abstractions are often times necessary but should be well-thought out. NRC staff supports the use of abstractions, insofar as the abstractions are shown to adequately represent the system being modeled.
- DOE and NRC staff agreed that alternate conceptual models should also be evaluated to investigate the impact of this type of uncertainty on the compliance demonstration.
- DOE and NRC staff agreed that deterministic models may be implemented if the model is robust, cautioned by sound justification for parameters and sufficient model supports.
- NRC staff noted that model complexity does not imply model strength or applicability.
- DOE and NRC staff agreed that sensitivity of model results to barrier performance assumptions should also be evaluated. Evaluating barriers may be a cost efficient endeavor as these may be the limiting factors of a particular model. Sensitivity of barriers helps to incorporate site specific phenomena such as dry or wet environments.
- DOE and NRC staff agreed that regarding the identification of parameters and greatest impact on projected dose, probabilistic analysis of parameters provides benefit to PA process, allowing one to focus resources for further research. Those parameter uncertainties that are reducible should perhaps be reduced and those apparently not reducible should drive further analysis. In

the end, it may be necessary to manage uncertainties with conservative assumptions, parameters, or models. Alternatively, uncertainty can be mitigated with changes to disposal facility design, additional waste removal, or other approaches necessary to demonstrate compliance.

- DOE and NRC staff agreed that implementing a simplified model requires a good understanding of the more complicated system. Without supporting information, model complexity in itself is not sufficient to demonstrate compliance with performance objectives. Complex models may provide a means to understand a complicated system, but not necessarily to justify that a complicated representation is needed to demonstrate compliance.
- DOE and NRC staff agreed that it is important to allow adequate time to conduct the analyses, and understand and interpret the results of sensitivity and uncertainty analyses.
- NRC staff stated that the uncertainty analysis for an intruder evaluation (for the performance objective of 10 CFR 61.42) does not need to be as comprehensive as an analysis for a member of the public (for the performance objective of 10 CFR 61.41). Generally, a range of scenarios are evaluated and the limiting scenarios are used to demonstrate compliance with the performance objective. NRC staff stated that qualitative arguments can be made including consideration of probability of the scenarios in the intruder calculations.

#### *Model Support*

- NRC staff noted that adequate documentation of model support from diverse sources of information helps minimize requests for additional information. Model support should be as risk-informed as possible. Furthermore, the amount of model support should be commensurate with the amount of risk associated with site.
- DOE and NRC staff agreed that development of model support for performance assessments is an iterative process. However, there should be

sufficient model support at the time decisions are made. DOE noted that PA & CA maintenance plans and monitoring plans are used in the approval process to incorporate commitment to address uncertainties and issues of model support for future iterations.

- DOE and NRC staff agreed that model support information should be incorporated into the performance assessment or supporting documentation provided.
- NRC staff noted benefit to the reviewer of a performance assessment to have sites interpret and consolidate the information supporting the models rather than providing a collection of references.

Conclusions and Actions:

- NRC staff requested copies of PA maintenance plans for Idaho, SRS Saltstone, and Tanks 17 and 20. DOE indicated that there is not a maintenance plan for Tanks 17 and 20 because they were closed prior to DOE Order 435.1, which provided the specific requirements for PA maintenance plans, but agreed to provide the maintenance plans for the other facilities.